

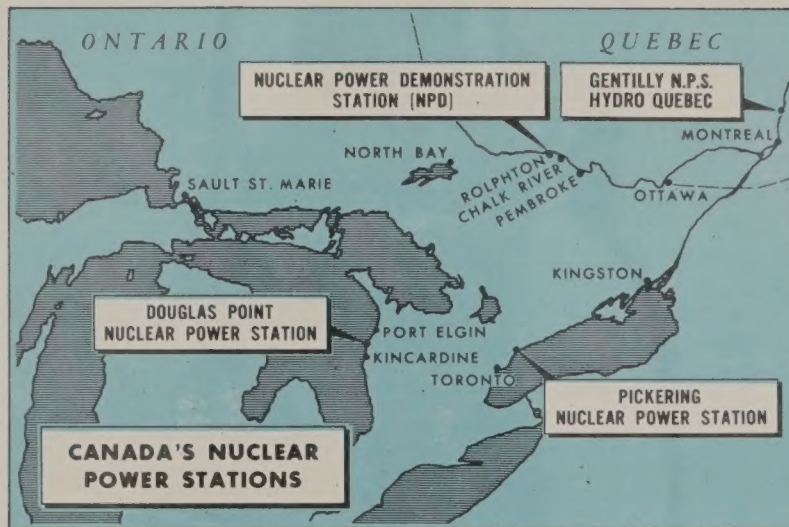
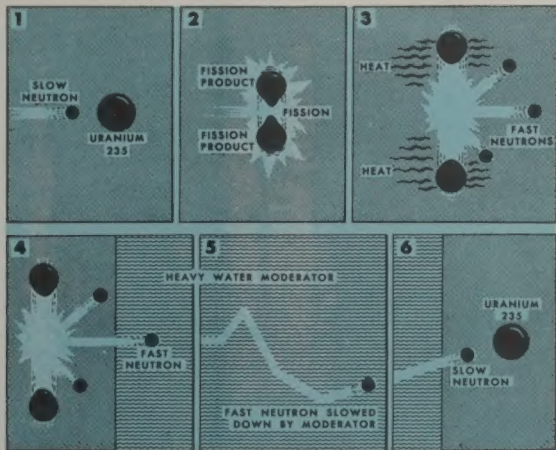
# WHAT IS NUCLEAR FISSION ?

Natural uranium—the uranium dug out of the ground—is made up of two different kinds of atoms. These two kinds of uranium atoms always occur in the same ratio. Less than one per cent of the atoms are uranium-235; the remainder are uranium-238 atoms. Usually only the uranium-235 atoms split or "fission" in a nuclear reactor.

When struck by a slow neutron (Fig. 1) a uranium-235 atom splits into two pieces (Fig. 2) called "fission products" which fly apart with great energy. As these two pieces move through the uranium fuel—and they move only a few thousandths of an inch—they collide with other atoms causing the uranium to become hot.

Two or three fast neutrons (Fig. 3), travelling at an average speed of 12,000 miles a second, are emitted when a uranium-235 atom splits. These fast neutrons must be slowed down to one or two miles a second before they will split other uranium-235 atoms.

The Douglas Point reactor system is so arranged that the fast neutrons travel through heavy water (Fig. 5) where they bounce against heavy hydrogen atoms. These collisions reduce or "moderate" the speed of the neutrons. The slow neutrons then split other uranium-235 atoms, producing still more neutrons. Thus there is a continuous splitting of atoms (that is, a "chain reaction") and a steady generation of heat.



## NOTES ON DOUGLAS POINT

Location . . . . . midway between Kincardine and Port Elgin, Ontario, on the eastern shore of Lake Huron

Output . . . . . 200,000 kilowatts of electricity

Fuel . . . . . natural uranium dioxide (50 tons)

Moderator . . . . . heavy water (167 tons)

Coolant . . . . . heavy water (43 tons)

Built by . . . . . Atomic Energy of Canada Limited

Operated by . . . . . Ontario Hydro

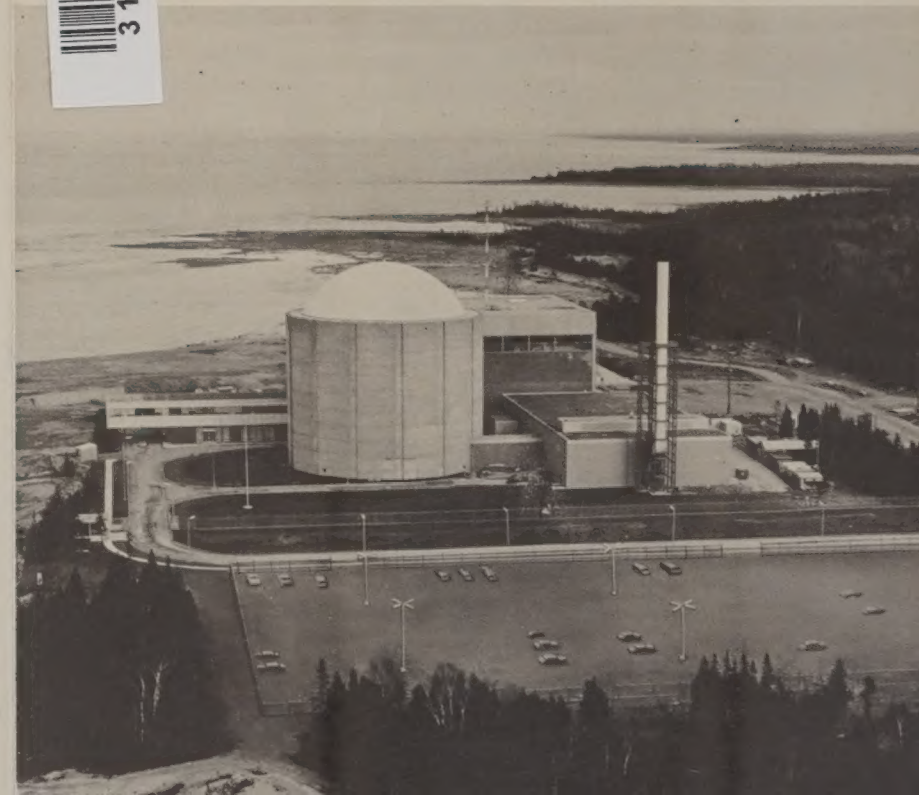
NOTE: Canada's first nuclear power station, the Nuclear Power Demonstration Station (NPD), near Rolphton, Ontario, began its full power output of 20,000 kilowatts on June 28, 1962. NPD served as a prototype for Douglas Point and for the Pickering Generating Station (output: 1,080,000 kilowatts of electricity) being built near Toronto by Ontario Hydro.

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## DOUGLAS POINT Nuclear Power Station



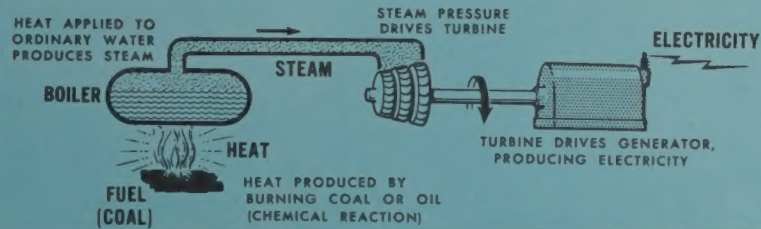


# WHAT IS NUCLEAR POWER ?

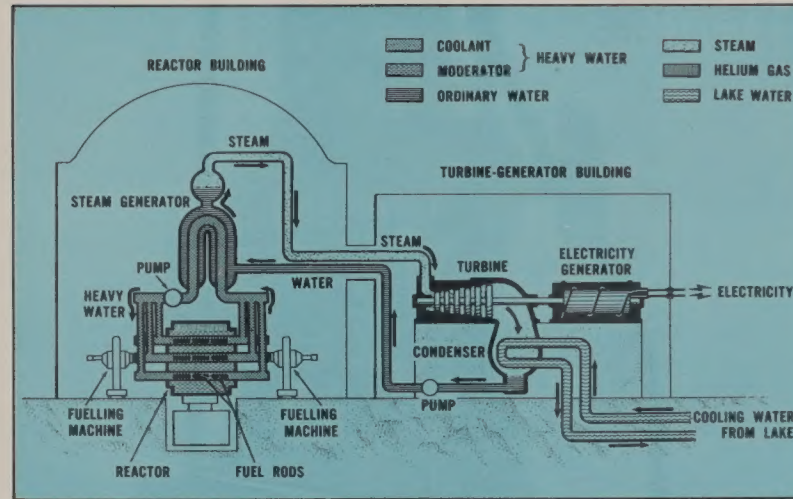
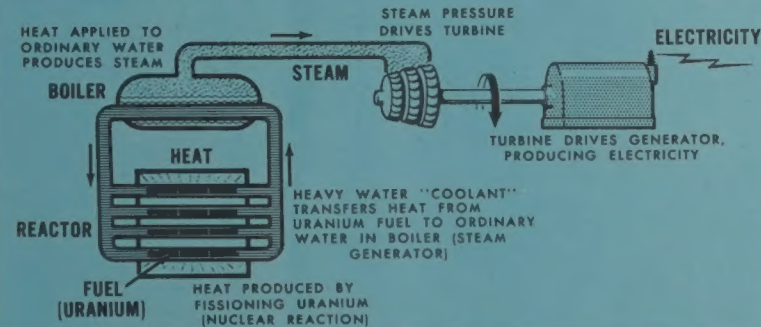
Hydro-electric stations use the energy of falling water to turn the turbines that drive the electricity generators; thermal-electric plants burn fossil fuels such as coal, oil or gas to produce steam to turn the turbines.

Nuclear power stations are simply thermal-electric plants in which the source of heat for the boiler is the "splitting" of atoms instead of the burning of fossil fuels. The same sequence of producing STEAM (in the boiler of the steam generator), MECHANICAL ENERGY (in the turbine) and ELECTRICITY (in the electricity generator) is followed in a nuclear power station as is followed in a conventional thermal-electric plant.

## CONVENTIONAL POWER PLANT



## NUCLEAR POWER PLANT



# HOW DOES DOUGLAS POINT WORK ?

The reactor is a steel tank, 20 feet in diameter and 17 feet long, through which pass 306 horizontal pressure tubes. Uranium fuel is placed in the tubes, which are surrounded by heavy water moderator.

The heavy water moderator in the reactor tank slows down neutrons, produced by the fuel, to the required speed to split uranium-235 atoms. This splitting of atoms produces heat in the fuel. To stop this 'chain reaction' and shut down the reactor, the heavy water can be released into a tank beneath the reactor.

The heavy water "coolant" or heat transport medium—in a separate system and pressurized to prevent boiling—is pumped through the pressure tubes to transfer the heat from the hot uranium fuel to the steam generators. There the heat is transferred from the heavy water to ordinary water which is converted into steam. The steam is fed to a conventional steam turbine which drives an electricity generator.

Two remotely-operated fuelling machines, one at either end of the reactor, are used to insert fresh uranium fuel and to remove spent fuel.

